~~TRANSPARENT SUBSTRATE WITH CONDUCTIVE MULTILAYER ANTIREFLECTION COATING, TOUCH PANEL USING TRANSPARENT SUBSTRATE, AND ELECTRONIC DEVICE USING TOUCH PANEL~~

TRANSPARENT BOARD WITH CONDUCTIVE MULTI-LAYER ANTIREFLECTION FILMS, TRANSPARENT TOUCH PANEL USING THIS TRANSPARENT BOARD WITH MULTI-LAYER ANTIREFLECTION FILMS, AND ELECTRONIC EQUIPMENT WITH THIS TRANSPARENT TOUCH PANEL

FIELD OF THE INVENTION

The present invention relates to a transparent board with conductive multi-layer antireflection films, in further details, relates to a transparent touch panel using this transparent board with multi-layer antireflection films and electronic equipment with this transparent touch panel.

BACKGROUND OF THE INVENTION

At present, it is known that electrodes for photoelectric transducers such as solar batteries, displaying devices of liquid crystals, and electrodes for touch panels are made using a transparent conductive film of indium tin oxide (ITO: In_2O_3+SnO2) or tin oxide (SnO_2) formed on a transparent substrate such as glass. Especially for use in liquid crystal or electrodes for touch panels, high transmissivity in visible wavelength and optimum surface resistance are demanded. Many studies are made using the glass substrates and resulted in many inventions of multi-layer films that present high transmissivity and optimum surface resistance. However, the glass substrate has a drawback of fragility and big weight, therefore light and no fragile transparent plastic substrate is recently used to form the multi-layer films.

However, the plastic substrate presents low transmissivity since the plastic material is intrinsically less transparent than the glass and the same multi-layer films as on the glass show lower transmissivity than those on the glass. Some trials to improve transmissivity are made by reducing thickness of the conductive film, which is restricted to maintain the demanded resistance. Therefore the plastic base still showed difficulty for the transmissivity in comparison with glass base.

Again, although multi-layer films with antireflection coating of transparent dielectric thin films are effective to improve transmissivity, the coating on the most exterior surface reduces the conductivity of the surface. It may not be used as the electrode board for the liquid crystals.

In order to overcome this difficulty, efforts are paid to reduce the view sense reflection index by 0.1% steps. Publication of Japanese Laid-Open Patent Application (Tokukai Hei6-316442/1994) published a proposal that antireflection films presents high transmissivity

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